

## TITLE OF THE INVENTION

### METHOD AND APPARATUS FOR RECORDING MANUFACTURER INFORMATION ON A RECORDING MEDIUM AND FOR DETERMINING WHETHER THE MANUFACTURER INFORMATION IS EFFECTIVE

## 5 CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of Korean Patent Application Nos. 98-23487, filed June 22, 1998 and 98-30753, filed July 29, 1998, in the Korean Patent Office, the disclosures of which are incorporated herein by reference.

## BACKGROUND OF THE INVENTION

### 10 1. Field of the Invention

The present invention relates to optical recording and reproduction (recording/reproduction) of video and/or audio data. More particularly, the present invention relates to a recording medium for storing identification information of a manufacturer of a recorder which modifies the contents of the recording medium, and a recorder and/or a player which have the manufacturer specific information and a method therefor.

### 2. Description of the Related Art

FIG. 1 shows a one dimensional structure of a general recording medium. As shown in FIG 1, a volume space, which is the entire recording medium, is comprised of a volume and file structure area and areas in which real data is recorded (used blocks #1, #2, and #3). Real data can be recorded in a physically scattered state by editing in a predetermined unit, such as a program or a title. General information on the disc and information on the structures of a file and a directory, as shown in FIG. 2, are recorded in the volume and file structure area.

FIG. 2 shows files existing on a file system used for an apparatus for recording and reproducing audio and/or video (A/V) data on a rewritable recording medium. A bitstream file is a file <sup>10</sup> on which real A/V data is recorded. An information file is a file containing information on the bitstream file. The file system may also include a resource file.

FIG. 3 shows the contents of the information file shown in FIG. 2. The contents can be classified into formatted bitstream information having a common format among

manufacturers, and manufacturer (specific) information having an individual format which is not compatible between manufacturers. The formatted information, which includes information for having a common function regardless of the manufacturer, is necessary to maintain compatibility. For example, the formatted information includes information on the starting position of a specific title in the bitstream file and information on a position corresponding to a specific time interval. The recorder and/or player obtains information on which position in the bitstream file is to be recorded and which position is to be reproduced through the formatted information and records/reproduces the bitstream file on the basis of the obtained information.

The manufacturer information that is used by each manufacturer to support specific functions of the respective manufacturer does not need to be compatible. For example, a function of recording information on the finally reproduced position in the bitstream file as the manufacturer information item and automatically reproducing from a position next to the finally reproduced position when the recording medium is reproduced later is an example of a specific function using manufacturer information. The specific function is supported only in the recording medium recorder/player which can support the manufacturer information.

In detail, as shown in FIG. 3, the contents of the manufacturer information are comprised of a manufacturer information header, for example, having information on the number of items (n) of the manufacturer information; the same number (n) of manufacturer information search pointers having information on the positions of the respective item of the manufacturer information (manufacturer information search pointer #1, ..., manufacturer information search pointer #n); and the respective manufacturer information items (manufacturer information item #1, .. manufacturer information item #n). A recorder/player of each manufacturer is expected to have at least one manufacturer information item.

The contents of the manufacturer information items can be understood and utilized only in the recorder/player of the specific manufacturer which generated the manufacturer information items, and are not compatible with the recorders/players of other manufacturers.

As described above, since the information for the specific function of the individual manufacturer is not compatible with information of other manufacturers, if additional recording/deleting processes are performed by a recorder/editor manufactured by a manufacturer B on a recording medium having the manufacturer information generated by a

manufacturer A, the manufacturer information of the manufacturer A may not be effective any longer. Since the manufacturer information is unique to the manufacturer A, only the manufacturer A can analyze and modify the information. Thus, the manufacturer B cannot modify or manage manufacturer A's information. When a recording medium of which the contents are modified is returned to the recorder/player of the manufacturer A for more recording or reproducing, a mis-operation can occur since the information item containing the information for the specific function set by the manufacturer A may no longer be effective. Therefore, a check should always be made as to whether the manufacturer information is effective before using the manufacturer information made by the manufacturer A when a recording medium is newly loaded into a recorder/player of the manufacturer A. Verification processes are complicated and it can take a long time to perform the processes when there is a large amount of recorded A/V data.

#### SUMMARY OF THE INVENTION

It is a first object of the present invention to provide a recording medium for storing manufacturer information for a specific function of recorders/players of different manufacturers.

It is a second object of the present invention to provide a recording medium for storing identification information of the manufacturer of a recorder/editor which last performed recording/deleting on the recording medium.

It is a third object of the present invention to provide a recorder/editor for and method of storing on a recording medium manufacturer information for a specific function of the recorder/editor of each different manufacturer.

It is a fourth object of the present invention to provide a recorder/editor for and a method of storing on a recording medium identification information of a manufacturer of the recorder/editor which performs recording/deleting.

It is a fifth object of the present invention to provide a recorder/player for and method of using the manufacturer information stored on the recording medium for the specific function of the recorders/players of each different manufacturer.

It is a sixth object of the present invention to provide a recorder/player for and method of checking whether the identification information of the manufacturer of a

recorder/editor which last performs recording/deleting on the recording medium is the same as the identification information of the manufacturer of the recorder/player to determine whether or not the manufacturer information is effective. That is, if the respective identification information is the same, then the manufacturer information item is effective. If not, the manufacturer information item may be not effective, thus requiring complete verification.

The above objects are achieved in accordance with the present invention with a rewritable recording medium to store audio/video (A/V) contents, including formatted information for the A/V contents, and manufacturer information to support the manufacturer's specific function, wherein the manufacturer information comprises an identification code of a manufacturer of a recording apparatus that last modified the content of the recording medium.

The above objects are achieved in accordance with the present invention with a recording apparatus for recording and/or editing audio, video, and/or information data on a rewritable recording medium, comprising a recording controller to produce A/V contents and formatted information for the A/V contents and manufacturer information to support the manufacturer's specific function, wherein the manufacturer information comprises an identification code of the manufacturer of a recording apparatus that last modified the content of the recording medium.

The above objects are achieved in accordance with the present invention with a reproducing apparatus for reproducing audio, video, and/or information data on a rewritable recording medium, comprising a reproducing controller to reproduce A/V contents and formatted information for the A/V contents and manufacturer information to support a manufacturer's specific function, wherein the manufacturer information comprises an identification code of the manufacturer of the recording apparatus that last modified the content of the recording medium.

The above objects are achieved in accordance with the present invention with a method of recording and/or editing audio, video, and/or information data on a rewritable recording medium, comprising ~~the step of~~ recording an identification code of the manufacturer of a recording apparatus which last modified the contents of the recording medium by performing recording/editing on the recording medium.

The above objects are achieved in accordance with the present invention with a method of recording/reproducing audio, video, and/or information data on a rewritable recording medium with a recording/reproducing apparatus using manufacturer information recorded on the recording medium, comprising ~~the step of~~ verifying a coincidence of an identification code of a manufacturer which last modified the contents of the recording medium and its own manufacturer identification code to determine whether its manufacturer specific information is effective.

## BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and advantages of the present invention will become more apparent by describing in detail a preferred embodiment thereof with reference to the attached drawings in which:

FIG. 1 shows a one-dimensional structure of a general recording medium;

FIG. 2 shows the file structure of the recording medium shown in FIG. 1;

FIG. 3 shows the contents of the information file shown in FIG. 2;

FIG. 4 is a block diagram of an optical recording and reproducing apparatus according to the present invention;

FIG. 5 is a table showing an example of detailed contents of a manufacturer information header for supporting a manufacturer specific function according to the present invention;

FIG. 6 is a table showing another example of detailed contents of a manufacturer information header according to the present invention;

FIG. 7 is a table showing the contents of a manufacturer information search pointer according to the present invention; and

FIG. 8 is a table showing the contents of a manufacturer information item according to the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, preferred embodiments of a recording medium and a recorder/ editor for storing manufacturer information for supporting specific functions of the manufacturer and a recorder/player for using manufacturer information for supporting specific functions of the

manufacturer according to the present invention and preferred embodiments of a method therefor will be described.

FIG. 4 is a block diagram of an optical recording and reproducing apparatus in accordance with the present invention. The function of an apparatus for recording A/V data on and reproducing A/V data from a recordable and rewritable recording medium is divided into recording and reproducing.

During recording, an A/V codec 110 compression-codes an A/V signal input by a predetermined compression coding scheme. A digital signal processor (DSP) 120 receives A/V data supplied from the A/V codec 110, adds parity data for an error correction code (ECC) process, and performs modulation by a predetermined modulation scheme. A radio frequency amplifier (RF AMP) 130 converts data supplied from the DSP 120 into an RF signal. A pick-up unit 140 drives a recording medium, records data corresponding to the RF signal from the RF AMP 130 on a recording medium, and includes an actuator for performing focusing and tracking. A servo unit 150 receives information required for controlling a servo from the RF AMP 130 and a system controller 160 and performs a stable servo operation. The system controller 160 controls the entire system, controls the A/V data to be recorded on the recording medium, and records information including information on the size and the position of the compressed data as well as manufacturer information on the recorder/editor performing the specific function, the recording/editing. Also, the system controller 160 determines whether the manufacturer information recorded on the recording medium is effective using the identification information on the recorder/editor performing the recording/editing functions by finally accessing the recording medium, and controls recording/editing operations using the determined manufacturer information.

During reproduction, the pick-up unit 140 provides an optical signal picked up from the recording medium in which data is stored. The RF AMP 130 converts the optical signal into an electrical signal and extracts the servo signal for performing the servo and extracts the modulated data. The DSP 120 demodulates the modulated data supplied from the RF AMP 130 corresponding to the modulation scheme used upon modulation, corrects errors by performing ECC, and removes the parity data. The servo unit 150 receives information required for controlling the servo from the RF AMP 130 and the system controller 160 and performs a stable servo operation. The A/V codec 110 decodes the compressed A/V data

supplied from the DSP 120 and outputs an A/V signal. The system controller 160 controls the entire system to reproduce data using the information recorded on the recording medium, performing a user interface, i.e., processing the key input of the user. Also, the system controller 160 determines whether the manufacturer information recorded on the recording medium is effective using the identification information on the recorder/editor performing the recording/editing functions by finally accessing the recording medium, and controls reproducing operations using the determined manufacturer information.

FIG. 5 is a table showing an example of detailed contents included in a manufacturer information header for a manufacturer specific function according to the present invention.

The table shown in FIG. 5 can be comprised of MNFI\_Ns which is information on the number of manufacturer information items, a manufacturer identification code (LAST\_MN) indicating the manufacturer of the recorder/editor which last modified the contents of the recording medium. Moreover, the table shown in FIG. 5 can include a product code (LAST\_PROD) indicating the product model of the recorder/editor which last modified the recording medium, and an operation code (OP\_CD) expressed by a predetermined code indicating information on an operation performed by the recorder/editor, for example, an operation of modifying A/V bitstream data on the recording medium by recording, editing, erasing, and a specific function other than simple reproduction.

The manufacturer identification code is for classifying different manufacturers, in which the respective manufacturers are expected to have unique values. Simple text data of the manufacturer's name can be used because it is very difficult to imagine that different manufacturers have the same name.

The operation code has compatibility since it must be understood by different manufacturers. The information on the recorder/editor performing the recording/editing by finally accessing the recording medium and the information on the performed operation are provided by recording such information on the manufacturer information header in each recorder/editor performing the recording/editing by accessing the recording medium. When only simple reproduction is performed, manufacturer identification information of the reproducing apparatus is not recorded on the manufacturer information header because there is no change in the contents of the recording medium.

Examples of using the manufacturer information using the above data structure are as follows. When the manufacturer A generates a manufacturer information item and records information on the recording medium and the manufacturer B edits the recording medium in the recorder/editor, the recorder/editor of the manufacturer B records the identification code of the manufacturer B, the product code of the recorder/editor and the operation code indicating information including that an editing operation has been performed on the manufacturer information header as shown in FIG. 5, before ejecting the recording medium.

When the data recorded on the recording medium is overwritten, edited, and reproduced using the manufacturer information item by the recorder, editor, and player of the manufacturer A, the identification information on the manufacturer which last used the recording medium, product information of the recorder/editor, and information on the operation performed in the manufacturer information header, it is determined whether the manufacturer information items to be used during recording, editing, and reproducing are effective.

If the manufacturer identification code recorded in the recording medium which identifies the manufacturer that last modified the recording medium is consistent with <sup>the</sup> concerned recorder/editor/player's manufacturer identification code, it is determined that the concerned manufacturer information item is effective. If the manufacturer identification code recorded in the recording medium is not consistent with the concerned manufacturer identification code, it must be determined whether the manufacturer information items to be used are effective by analyzing the entire contents of the recording medium. When the manufacturer information items are effective, they can be used.

Also, when the recorder/editor which last modified the recording medium is the current recorder/editor and the editing operation is finally performed, it is easily judged that the manufacturer information item for the manufacturer is effective since it is possible to update the manufacturer information item according to the recording/editing operation by analyzing the contents of the manufacturer information item corresponding to the modified contents. Accordingly, it is possible to reduce the time required to determine whether the manufacturer information items are effective. When the manufacturer information items are effective, it is possible to perform the recording, the editing, and/or reproduction using the manufacturer information items.



FIG. 6 is another example of a manufacturer information header according to the present invention. As shown in FIG. 6, MNFI\_Ns indicates the number of manufacturer information items, MNFIT\_EA indicates the last address of a manufacturer information, LAST\_MN indicates an identification code of a manufacturer of a recorder/editor which last modified A/V contents. LAST\_PROD indicates a code of a product which last modified the A/V contents. MN\_CD indicates the manufacturer code corresponding to the number of manufacturer information items, PROD\_CD indicates the product codes of the respective manufacturer information items. FILE\_NAME indicates the file name of an additional file for individual information, and REC\_TM indicates the time in which individual information was recorded. The MN\_CD and/or PROD\_CD and/or FILE\_NAME and/or REC\_TM can be recorded in the beginning part of the respective manufacturer information items.

To restrict the size of manufacturer information, there is a maximum number of MNFI\_Ns (for example, up to 5). When the number of manufacturer information items exceeds the maximum number, the oldest records can be deleted. If the manufacturer information item has an additional file when the manufacturer information item is deleted, this file is also deleted. When a recorder/editor modifies the recording medium content and it has its own manufacturer information item, only the concerned manufacturer information is updated and other manufacturer information items should remain unchanged. When a recorder/editor modifies the recording medium content but it does not have its own manufacturer information item, even in this case, the identification code of the manufacturer which modifies the recording medium should be recorded.

MNFIT\_EA is the last address of a manufacturer information, for example, having a relative block number (RBN) from the first byte position of the manufacturer information header. LAST\_MN denotes a manufacturer identification code which last modified the A/V contents. It is mandatory to have this recorded when the A/V contents are modified by the recorder/editor even if the recorder/editor does not have the manufacturer information item therefor. LAST\_PROD made by the manufacturer denotes a product code of the product which last modified the A/V contents. It must be recorded when the recorder/editor modifies the A/V contents even if the recorder/editor does not have the manufacturer information item therefor. Since the manufacturer identification codes must be classified according to the respective manufacturers, they preferably have unique values according to the respective

manufacturers. Also, since a manufacturer may have various products, it is recommended that the manufacturer manage the product codes.

Namely, a set in which the A/V contents are modified in order to make the information in relation to real A/V contents identical to A/V contents must record the manufacturer identification information in the manufacturer identification code field (LAST\_MN) of the manufacturer information header even if there is no manufacturer information item of its own. Also, when the recording medium is inserted into a set, it must be checked whether the real A/V contents are identical to the manufacturer's information item which is specific to the manufacturer in relation to the A/V contents of the recording medium. The first and easiest way is to check the identification code of the manufacturer which last modified the recording medium. When the A/V contents are modified by other manufacturer's equipment, a concerned set must modify or update the information in relation to A/V contents.

MN\_CD and PROD\_CD are manufacturer codes and the product codes, as many as stored manufacturer information items, to indicate that each manufacturer information item belongs to which manufacturer and product. When the information for the manufacturer products exists in an additional file, FILE\_NAME is the name of the file. If there is no file, the FILE\_NAME is filled with a special value. REC\_TM denotes the time when the information is recorded. MN\_CD, REC\_TM, PROD\_CD, FILE\_NAME can be recorded in the beginning part of the respective manufacturer information items.

FIG. 7 is a table showing the contents of a manufacturer information search pointer according to the present invention. FIG. 7 includes MNFI\_SA which denotes the starting address of the manufacturer information item. The MNFI\_SA is the starting address of the manufacturer information item, for example, having RBN from the first byte of the manufacturer information header.

FIG. 8 is a table showing the contents of the manufacturer information items according to the present invention, which has bytes of variable length. The maximum size of the information is, for example, 10 Kilobytes (KB). When the size of the information exceeds 10 KB, the additional information file of the manufacturer can be used.

As described above, according to the present invention, a recording medium is provided, which contains A/V data and formatted information to use the A/V data for

recording and reproducing, and manufacturer information to support manufacturer specific function which cannot be implemented using the formatted information. Moreover, manufacturer information is provided to support multiple manufacturer information items. Such information also contains the identification code of the manufacturer which last  
5 modified the contents of the recording medium. This information can be used to check the effectiveness of its own manufacturer information item when the recording medium is recorded, edited, reproduced by multiple equipment of different manufacturers since the manufacturer information item which is specific to the manufacturer can not be managed by  
a other manufacturer's equipment. Accordingly, it is possible to reduce the time taken to  
10 determine whether the manufacturer information items are effective.

Although a few preferred embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.